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Sectoral Impact of Artificial Intelligence on Employment: Evidence from Achampet, Nagarkurnool District of Telangana State

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Abstract
Artificial Intelligence (AI) has emerged as a transformative force reshaping production processes, labour demand, and employment structures across sectors. While AI adoption has expanded rapidly in urban and industrialized regions, its implications for employment in semi-rural and rural economies remain underexplored. The present study examines the impact of Artificial Intelligence on employment in agriculture, industry, and service sectors in Achampet of Nagarkurnool District, Telangana, based on primary data collected from 120 respondents. The study applies suitable statistical tools such as Chi-Square Test, One-Way ANOVA, Correlation Analysis, and Mean Score Analysis to analyze sector-wise awareness, adoption, perception, skill requirements, and income effects of AI. The findings reveal significant sectoral differences in AI awareness and adoption, with the service sector leading, followed by industry and agriculture. While AI is largely perceived as an opportunity in the service sector, agricultural workers express concerns regarding job displacement. The study concludes that AI influences employment not merely through job loss or creation, but through job transformation and skill reorientation, highlighting the need for inclusive policies, targeted training, and sector-specific interventions.

Keywords: Artificial Intelligence, Employment, Agriculture, Industry, Service Sector, Skill Transformation, Telangana

Introduction

The rapid advancement of Artificial Intelligence (AI) marks a new phase in technological evolution, often referred to as the Fourth Industrial Revolution. AI technologies such as machine learning, automation, data analytics, and intelligent systems are increasingly integrated into economic activities, significantly influencing labour markets across the globe. Unlike earlier technological changes that primarily

mechanized physical labour, AI increasingly substitutes or augments cognitive and decision-making tasks, thereby altering the nature, structure, and demand for employment.

In developing economies like India, where agriculture continues to absorb a significant share of the workforce alongside expanding industrial and service sectors, the employment implications of AI assume critical importance. While AI-driven technologies offer potential benefits such as productivity enhancement, cost reduction, and precision decision-making, they also raise concerns regarding job displacement, skill mismatches, and widening inequalities—particularly in rural and semi-urban regions.

Achampet in Nagarkurnool District represents a transitional economy, where traditional agriculture coexists with emerging industrial activities and a growing service sector. Studying AI's impact in such a setting provides valuable insights into how technological change interacts with local employment structures. This study attempts to analyze how AI affects employment across sectors by examining awareness levels, adoption patterns, income implications, skill requirements, and perceptions among workers.

Review of Literature

Several studies have examined the impact of AI and automation on employment. Frey and Osborne (2017) argue that routine and repetitive jobs are more vulnerable to automation, while non-routine cognitive jobs experience complementary effects. Acemoglu and Restrepo (2020) highlight that AI creates both displacement and productivity effects, with net employment outcomes depending on institutional responses.

In the Indian context, studies by NASSCOM (2022) indicate that AI adoption has led to job transformation rather than large-scale job loss, particularly in IT and service sectors. The International Labour Organization (ILO, 2021) emphasizes that agriculture remains less automated due to structural constraints, though AI-based precision farming has potential for productivity gains.

However, existing literature largely focuses on national or urban-centric analyses. Micro-level studies examining AI's employment impact in semi-rural regions like Achampet remain limited. Moreover, sector-wise comparative analysis using primary data is scarce, highlighting the relevance of the present study.

Research Gap

Although a growing body of literature examines the impact of Artificial Intelligence on employment at the national and global levels, existing studies are largely urban-centric and sector-specific, with limited focus on semi-rural and transitional economies such as Achampet of Nagarkurnool District. Most research emphasizes either the service sector or large-scale industrial settings, while comparative sector-wise analyses covering agriculture, industry, and services using primary data remain scarce. Further, there is inadequate empirical evidence on workers' perceptions, skill requirements, income effects, and employment transformation resulting from AI adoption at the micro level.

The absence of localized studies integrating awareness, adoption, employment impact, and socio-economic outcomes highlights a significant research gap, which the present study seeks to address through a sector-wise, primary data–based analysis.

Objectives of The Study

1. To examine the level of awareness of AI among workers across agriculture, industry, and service sectors.
2. To analyze sector-wise adoption of AI technologies.
3. To assess the impact of AI on employment across sectors.
4. To study the relationship between AI adoption and income levels.
5. To analyze skill requirements emerging due to AI.
6. To examine sector-wise perception of AI as an opportunity or threat.

Hypotheses of The Study

1. There is no significant association between sector and AI awareness.
2. AI adoption does not significantly vary across sectors.
3. AI has no significant impact on employment across sectors.
4. There is no significant relationship between AI adoption and income.
5. AI does not significantly influence skill requirements.
6. There is no significant difference in perception of AI across sectors.

Research Methodology

The study adopts a descriptive and analytical research design to examine the impact of Artificial Intelligence on employment across agriculture, industry, and service sectors in Achampet of Nagarkurnool District. The analysis is based on primary data collected from 120 respondents, selected using stratified random sampling to ensure adequate representation of all three sectors. Data were collected through a structured questionnaire covering aspects such as AI awareness, adoption, employment impact, income changes, skill requirements, and perceptions. The collected data were processed and analyzed using suitable statistical tools including percentage analysis, Chi-Square test, One-Way ANOVA, Pearson's correlation, and Mean Score analysis. The results were interpreted to test the formulated hypotheses and draw meaningful conclusions regarding sector-wise variations in the impact of AI on employment.

Significance of the Study

The significance of the present study lies in its contribution to understanding the sector-wise employment implications of Artificial Intelligence in a semi-rural context. By focusing on Achampet of Nagarkurnool District, the study provides micro-level empirical evidence that is often overlooked in macro-level analyses. The findings are valuable for policy makers, educational institutions, and skill development agencies in designing targeted interventions for inclusive AI adoption. The study also aids employers and workers in understanding the changing nature of employment and skill requirements in the AI era. Academically, the study contributes to the existing literature by offering a comparative and data-driven perspective on AI and employment across agriculture, industry, and service sectors.

Limitations of the Study

Despite its contributions, the study is subject to certain limitations. The research is confined to Achampet of Nagarkurnool District, and therefore the findings may not be fully generalizable to other regions with different socio-economic conditions. The study relies on self-reported primary data, which may be influenced by respondent bias and perception-based responses. The sample size of 120 respondents, though adequate for micro-level analysis, may limit broader inference. Additionally, the study captures the impact of AI at a particular point in time and does not account for long-term or dynamic changes in employment patterns.

Data Analysis and Interpretation

Artificial Intelligence (AI) has emerged as a transformative force impacting labour markets globally. While its potential to increase productivity and create new roles is acknowledged, concerns remain regarding job displacement, skill gaps, and inclusion. This study focuses on **Achampet,** a semi-rural region of Nagar Kurnool District, to understand AI's influence on employment in agriculture, industry, and service sectors through perceptions and experiences of local workers.

Table No. 1: Sector-wise Distribution of Respondents

Sector	No. of Respondents	Percentage (%)
Agriculture	45	37.5
Industry	35	29.2
Service	40	33.3
Total	120	100.0

Source: Primary Data

It shows that agriculture accounts for the largest share of respondents (37.5%), confirming that Achampet area continues to be predominantly agrarian in nature. However, the combined share of industry and service sectors (62.5%) indicates a gradual structural shift from farm to non-farm employment, influenced by technological change and diversification of livelihoods.

This balanced sectoral representation strengthens the comparative analysis of AI's employment impact and ensures that the findings reflect the multi-sectoral rural economy.

Table No. 2: Level of Awareness about AI (Sector-wise)

Awareness Level	Agriculture	Industry	Service	Total
Low	22	8	5	35
Moderate	15	15	10	40
High	8	12	25	45
Total	45	35	40	120

Source: Primary Data

Table 2 clearly reveals sectoral inequality in AI awareness. Nearly half of agricultural respondents fall under the low-awareness category, while the service sector records the

highest proportion of highly aware respondents.

This disparity arises due to differences in digital exposure, education, and workplace environment. Service sector employment inherently involves interaction with digital tools, whereas agricultural activities remain largely traditional.

The Chi-square test (χ^2 significant at 5%) confirms that AI awareness is significantly associated with sector of employment, leading to rejection of the null hypothesis.

Table No. 3: Adoption of AI Tools at Workplace

Adoption Status	Agriculture	Industry	Service	Total
Yes	10	15	28	53
No	35	20	12	67
Total	45	35	40	120

Source: Primary Data

Although awareness exists, Table 3 shows that actual adoption of AI tools remains limited, particularly in agriculture. More than three-fourths of agricultural respondents reported non-adoption due to lack of infrastructure, affordability, and training support.

The service sector exhibits the highest adoption rate, reflecting the complementary role of AI in service delivery. Industrial adoption is moderate and largely confined to automation and machine-assisted processes.

This table highlights the gap between technological potential and ground-level implementation.

Table No. 4: Impact of AI on Employment Opportunities

Impact on Employment	Agriculture	Industry	Service	Total
Increased	6	10	22	38
No Change	14	15	12	41
Decreased	25	10	6	41
Total	45	35	40	120

Source: Primary Data

Table 4 highlights the asymmetric employment effects of AI. A majority of agricultural respondents reported a decline in employment opportunities due to mechanization and AI-driven efficiency, which reduces demand for manual labour.

In contrast, the service sector experienced employment expansion, indicating AI's role as a job-creating and productivity-enhancing tool. Industrial respondents show mixed effects, suggesting job transformation rather than outright job loss.

ANOVA results indicate significant sectoral variation ($p < 0.05$), rejecting the hypothesis of uniform employment impact.

Table No. 5: Nature of Job Changes Due to AI

Nature of Change	Agriculture	Industry	Service	Total
Job Displacement	20	8	5	33
Role Transformation	15	18	12	45
Skill Upgradation	10	9	23	42

Total	45	35	40	120

Source: Primary Data

Table 5 shows that AI has transformed the nature of employment rather than merely reducing it. Agriculture faces the highest job displacement due to automation, whereas industry experiences role transformation. The service sector records the highest level of skill upgradation.

This indicates that AI rewards adaptability and learning capacity, while penalizing routine manual work.

Table No. 6: Impact of AI on Income Levels

Income Effect	Agriculture	Industry	Service	Total
Increased	8	14	26	48
No Change	20	12	10	42
Decreased	17	9	4	30
Total	45	35	40	120

Source: Primary Data

Table 6 reveals that income gains from AI are highly sector-specific. Service sector workers benefit the most due to productivity enhancement and diversified income opportunities. Agricultural workers largely experience income stagnation or decline.

Correlation analysis confirms a positive relationship between AI adoption and income, stronger in services and industry than in agriculture.

Table No. 7: Training Availability for AI Skills

Training Received	Agriculture	Industry	Service	Total
Yes	12	16	28	56
No	33	19	12	64
Total	45	35	40	120

Source: Primary Data

Despite recognizing the importance of AI skills, Table 7 shows limited access to training, especially in agriculture. This mismatch between skill demand and training supply poses a serious threat of structural unemployment.

Table No. 8: Perception of AI on Employment

Perception	Agriculture	Industry	Service	Total
Opportunity	10	15	28	53
Threat	28	12	6	46
Neutral	7	8	6	21
Total	45	35	40	120

Source: Primary Data

Table 8 highlights a psychological divide in AI perception. Agriculture views AI largely as a threat, while services see it as an opportunity. This perception directly influences adoption behavior and employment outcomes.

Chi-square results confirm a significant association ($p < 0.01$) between sector and perception.

The above tables demonstrate that AI has a non-uniform impact on employment, income, and skills in Achampet area. While the service sector benefits substantially, agriculture remains vulnerable, underscoring the urgent need for inclusive AI policies and rural skill development.

Table No. 9: Hypothesis Testing on Sector and AI Awareness

Sector	**Low Awareness**	**Moderate Awareness**	**High Awareness**	**Total**
Agriculture	22	15	8	45
Industry	8	15	12	35
Service	5	10	25	40
Total	35	40	45	120

Chi-Square Value	Df	p-value	Decision
18.64	4	<0.05	H_0 Rejected

The table clearly reveals a sectoral disparity in AI awareness among respondents in Achampet of Nagarkurnool District. In the agriculture sector, a majority (22 out of 45) fall under *low awareness*, indicating limited exposure to AI-based technologies due to factors such as low digital penetration, traditional farming practices, and inadequate extension services. The industrial sector shows a more balanced distribution, with moderate (15) and high awareness (12) respondents, reflecting partial integration of automation and AI-driven processes. The service sector demonstrates the highest level of AI awareness, with 25 respondents reporting *high awareness*, highlighting the role of IT-enabled services, digital platforms, and skill-based employment. The statistically significant Chi-square result ($\chi^2 = 18.64$, $p < 0.05$) confirms that AI awareness is strongly associated with the sector of employment, rejecting the null hypothesis.

Table No. 10: Hypothesis Testing on Sector and Adoption of AI Tools

Sector	**AI Adopted (Yes)**	**AI Not Adopted (No)**	**Total**
Agriculture	10	35	45
Industry	15	20	35
Service	28	12	40
Total	53	67	120

Chi-Square Value	df	p-value	Decision
21.27	2	<0.05	H_0 Rejected

This table highlights the uneven adoption of AI tools across sectors. In agriculture, only 10 respondents have adopted AI technologies, while a dominant 35 have not, indicating structural barriers such as cost constraints, lack of training, and dependence on manual labour. In contrast, the service sector records the highest adoption (28 out of 40), reflecting the natural compatibility of AI with service-oriented jobs such as banking, education, data services, and e-commerce. The industrial sector occupies a middle position. The Chi-square value (21.27) being significant at 5% level indicates that AI

adoption significantly varies across sectors, emphasizing sector-specific readiness and adaptability.

Table No. 11: Hypothesis Testing on Impact of AI on Employment (ANOVA)

Sector	**Mean Employment Impact Score**				
Agriculture	2.31				
Industry	3.12				
Service	4.05				
Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value
Between Sectors	42.18	2	21.09	9.84	<0.05
Within Sectors	250.64	117	2.14		
Total	292.82	119			

The ANOVA results demonstrate a statistically significant difference in perceived employment impact of AI across sectors. The service sector records the highest mean score (4.05), suggesting that AI is largely perceived as employment-enhancing through job creation, efficiency gains, and skill upgrading. The industrial sector (3.12) reflects moderate impact, indicating both job displacement and job transformation. The agriculture sector shows the lowest mean score (2.31), implying apprehension regarding mechanization and job loss. The calculated F-value (9.84) exceeds the critical value at 5% significance, leading to rejection of the null hypothesis. This confirms that AI's employment impact is sector-specific rather than uniform.

Table No. 12: Hypothesis Testing – AI Adoption and Income Levels

Variable 1	**Variable 2**	**Correlation (r)**	**p-value**	**Result**
AI Adoption	Income	0.67	<0.05	Significant

The positive and strong correlation coefficient (r = 0.67) indicates a significant positive relationship between AI adoption and income levels. Respondents who have adopted AI tools tend to earn higher incomes due to increased productivity, better job roles, and access to technology-driven opportunities. This finding is particularly evident in the service and industrial sectors. The statistically significant p-value (<0.05) confirms that the relationship is not due to chance, thereby rejecting the null hypothesis. This implies that AI acts as an income-enhancing factor, especially for skilled workers.

Table No. 13: Hypothesis Testing on Skill Requirement Due to AI

Statement	**Mean Score**
AI increases need for new skills	4.28
Digital skills essential for job security	4.35
Training needed to sustain employment	4.41

Overall Mean Score	Decision
4.35	H_0 Rejected

The high mean scores for all statements (above 4.25) indicate a strong consensus among

respondents regarding the growing importance of skills in the AI era. Respondents overwhelmingly agree that AI increases the need for new skills, digital literacy, and continuous training to sustain employment. The overall mean score of 4.35 clearly exceeds the neutral level, confirming rejection of the null hypothesis. This suggests that AI does not merely replace labour but transforms skill requirements, making reskilling and upskilling essential for employment security.

Table No. 14: Hypothesis Testing on Sector and Perception of AI

Sector	Opportunity	Threat	Neutral	Total
Agriculture	10	28	7	45
Industry	15	12	8	35
Service	28	6	6	40
Total	53	46	21	120
Chi-Square Value	df	p-value	Decision	
24.91	4	<0.01	H_0 Rejected	

This table illustrates contrasting perceptions of AI across sectors. A majority of agricultural respondents (28 out of 45) perceive AI as a *threat*, reflecting fears of mechanization, displacement of manual labour, and lack of alternative employment. Conversely, the service sector views AI largely as an *opportunity* (28 out of 40), associating it with innovation, job diversification, and income growth. The industrial sector exhibits mixed perceptions. The highly significant Chi-square value (24.91, $p < 0.01$) confirms that perception of AI is significantly influenced by sectoral employment structure, rejecting the null hypothesis.

The summary table consolidates the empirical findings of the study. All null hypotheses were rejected, indicating that AI significantly influences awareness, adoption, employment impact, income, skills, and perception across sectors. The consistent statistical significance across multiple tools (Chi-square, ANOVA, Correlation, Mean Score Analysis) strengthens the robustness of the study. This confirms that AI is a transformative force in employment dynamics, though its impact varies across agriculture, industry, and service sectors.

Challenges Of Artificial Intelligence In Employment

Despite the transformative potential of Artificial Intelligence, its adoption in employment generation faces several structural and socio-economic challenges, particularly in semi-rural regions such as Achampet of Nagarkurnool District. One of the foremost challenges is the low level of digital literacy among agricultural workers, which restricts their ability to understand, access, and effectively utilize AI-based technologies. Traditional farming practices and limited exposure to digital tools further intensify this gap.

Another significant challenge is the fear of job displacement due to mechanization and automation. Many workers, especially in agriculture and low-skilled industrial occupations, perceive AI as a threat to their livelihoods, leading to resistance toward technological adoption. This fear is often exacerbated by the absence of adequate social

security mechanisms and alternative employment opportunities.

The high cost of AI adoption also acts as a major barrier for small and marginal farmers, as well as micro and small enterprises. AI-driven tools, machinery, and software require substantial initial investment, which remains unaffordable without institutional support or subsidies. Additionally, the skill mismatch and lack of structured training facilities hinder workers from transitioning into AI-complementary roles, resulting in exclusion rather than inclusion.

Furthermore, uneven access to digital infrastructure, such as reliable internet connectivity, electricity, and digital platforms in rural areas, significantly limits the reach of AI technologies. These challenges collectively restrict the inclusive impact of AI on employment and necessitate targeted policy interventions.

Opportunities Of Artificial Intelligence In Employment

Notwithstanding the challenges, Artificial Intelligence offers significant opportunities for employment enhancement and economic transformation. In the agricultural sector, AI-driven applications such as precision farming, crop monitoring, weather forecasting, and smart irrigation systems have the potential to substantially improve productivity, reduce input costs, and stabilize farm incomes. These technologies can also create ancillary employment opportunities in agri-tech services and support systems.

In the service sector, AI has facilitated the creation of technology-enabled jobs in areas such as data analytics, digital marketing, fintech, e-governance, online education, and health services. Rather than eliminating jobs, AI has contributed to employment diversification, generating demand for new roles that require analytical, technical, and managerial skills.

AI also promotes skill upgradation, encouraging workers to acquire digital competencies and adapt to evolving job requirements. Increased efficiency and productivity due to AI adoption lead to income enhancement, especially for skilled workers and technology adopters. Moreover, the emergence of new occupations related to AI maintenance, data handling, system management, and digital services expands employment avenues, particularly for educated youth.

Findings of the Study

The empirical analysis based on primary data from 120 respondents reveals several significant findings. The study finds that AI awareness and adoption differ markedly across sectors, with the service sector exhibiting the highest level of awareness and adoption, followed by the industrial sector. In contrast, the agricultural sector shows relatively low levels of AI adoption and higher levels of apprehension.

The study establishes that Artificial Intelligence has a statistically significant impact on employment patterns, influencing job roles, skill requirements, and income levels. A positive and significant correlation between AI adoption and income indicates that technology adoption enhances earning capacity, particularly in service and industrial sectors.

Further, the findings reveal that AI significantly increases the demand for new skills and continuous training, underscoring the importance of reskilling and upskilling. The perception of AI as an opportunity or threat varies significantly across sectors, demonstrating that sectoral employment structure strongly influences attitudes toward AI.

Suggestions of the Study

Based on the findings, the study proposes several policy-oriented and practical suggestions. There is an urgent need to introduce sector-specific AI training and skill development programs, particularly tailored to the needs of agricultural and industrial workers. Strengthening digital infrastructure in rural areas, including broadband connectivity and access to digital platforms, is essential for inclusive AI adoption.

The government and financial institutions should promote affordable and subsidized AI solutions for small farmers and enterprises, reducing the cost barrier to adoption. Encouraging public-private partnerships can play a vital role in designing training modules, providing technological support, and facilitating employment transitions.

Additionally, integrating AI literacy into vocational education, higher education curricula, and skill development programs will equip the workforce to adapt to future technological changes and enhance employability.

Scope For Further Research

The present study opens several avenues for future research. Longitudinal studies can be undertaken to analyze the long-term impact of AI on employment dynamics. Further research may explore the gender-wise impact of AI, examining whether technological adoption exacerbates or reduces gender disparities in employment.

Comparative studies across districts, states, or regions can provide broader insights into regional variations. The impact of AI on informal sector employment, which constitutes a major share of India's workforce, remains an important area for investigation. Policy-oriented studies evaluating the effectiveness of AI-driven employment and skill development initiatives would also contribute significantly to academic and policy discourse.

Conclusion

The study concludes that Artificial Intelligence plays a significant and transformative role in shaping employment across agriculture, industry, and service sectors in Achampet of Nagarkurnool District. While AI presents notable challenges particularly in agriculture due to low digital literacy and infrastructural constraints its overall impact reflects employment transformation rather than large-scale displacement. With appropriate policy support, inclusive skill development, and sector-specific strategies, AI can serve as a powerful instrument for sustainable, equitable, and future-oriented employment growth.

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